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मानक

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IS 1989-2 (1986): Leather Safety Boots and Shoes, Part 2:
For Heavy Metal Industries [CHD 19: Footwear]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 1989 (Part 2) : 1986
(Reaffirmed 2011)

Indian Standard
SPECIFICATION FOR
LEATHER SAFETY BOOTS AND SHOES
PART 2 FOR HEAVY METAL INDUSTRIES
(Fourth Revision)

Second Reprint JANUARY 2005
(Including Amendment No. 1 and 2)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

AMENDMENT NO. 2 APRIL 1999
TO
IS 1989 (PART 2) : 1986 SPECIFICATION FOR
LEATHER SAFETY BOOTS AND SHOES
PART 2 FOR HEAVY METAL INDUSTRIES

(Fourth Revision)

(Page 10, clause 9, Title) — Substitute 'CONSTRUCTION' for 'MANUFACTURE'.

(Page 10, clause 9.2, line 4) — Substitute '3 mm' for '3 cm'.

(Page 10, clause 9.4) — Substitute the following for the existing text:

'The counter shall be turned over so as to form a jugloop as shown in Fig. 1. The distance between top of quarter to the top of jugloop shall be 20 mm. The joint of the quarters shall be reinforced by stitching s wide strip of leather at the back. A strengthening leather piece (see 8.17) shall be pasted and stitched at the centre of the inside quarter.'

(Page 22, Appendix B) — Substitute the following for the existing text:

' APPENDIX B
(Clauses 12.1 and 18.1)

DETERMINATION OF IMPACT VALUE

B-1 GENERAL

The impact test is carried out for determining the performance of safety boots reinforced with steel toe cap to withstand a blow of 14 kgf.m.

B-1.1 Test Specimen

B-1.1.1 The test shall be made on the toe of the finished safety boots/shoes, sampled from each size of a lot.

B-1.1.2 Pattern of Boot

The test shall apply only to safety boots and shoes fitted with protective steel toe caps.

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B-1.1.3 *Preparation of Test Specimen*

Prepare test specimen from the forepart of the footwear by cutting off the toe end not more than 30 mm from the rear edge of the toe cap. The upper and lining shall not be separated.

B-2 APPARATUS

B-2.1 The testing apparatus shall be such that a 27.0 ± 0.2 kg load can be allowed to fall freely on vertical guides from various predetermined heights to strike a cylindrical mild steel plunger, 38 mm in diameter and 145 mm in length. Before carrying out any test, the test apparatus shall be checked for its ability to fall freely without any restriction up to the striking bar at the base of the apparatus. The plunger shall be freely supported in a vertical guide, and shall have attached to its lower end a horizontal mild steel bar 155 mm long, 38 mm wide and 10 mm thick. The bar (strike plate) shall be capable of resting across the toe-cap with its front edge in line with the point of toe-cap. The upper end of the plunger shall have a mild steel plate of 63 mm $\times$ 63 mm, screwed to it, and can be replaced when damaged. The above dimensions shall have a tolerance of ± 1 mm.

B-2.1.1 The base of the machine shall be solidly constructed of hard wood of not less than 75 mm thick. To this a metal block (50 mm thick) shall be bolted to support the steel plate on which the boot rests.

B-2.1.2 A capsule as illustrated in Fig. 5 suitable for measuring clearance inside the boot/shoe at the moment of impact shall be used. The capsule consists of a small duraluminium plunger which is depressed on impact into a brass cylinder. The metal clip shall be fastened around a rubber tubing which encases the cylinder and by tightening and loosening the clip the amount of friction between the cylinder and plunger can be varied. The cylinder wall shall be slotted to enable the clip to compress the cylinder on to the plunger. The clip shall be adjusted so that the movement between the two parts takes place at a load of less than 14.0 N, but no movement takes place at a load of 8.0 N.

B-2.1.3 *Stabilizing Fork*

The details of a suitable stabilizing fork have been given in Fig. 6A and 6B.

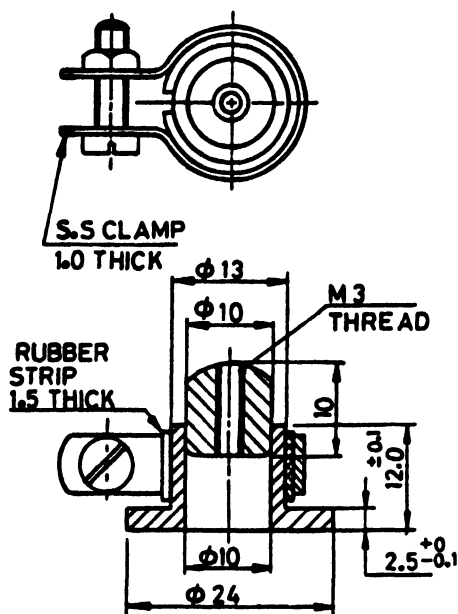
B-3 PROCEDURE

B-3.1 Positioning

Place the capsule in the slot of the stabilization fork and position it close to the rear end of the slot. Then place the test specimen on the clamping base so that the fork tips touch the fore end of its inner lining. The details of a suitable

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stabilizing fork have been given in Fig. 6A and 6B. Fix the stabilizing fork by means of the clamping screw to rest on the insole. Now adjust both the clamping screw and the adjusting screw so that the stabilizing fork becomes more or less parallel to the base plate and the teat piece is damped firmly (see Fig. 8).



All dimensions in millimetres.

FIG. 5 CAPSULE FOR MEASURING THE CLEARANCE AT THE
MOMENT OF IMPACT

Amend No. 2 to IS 1989 (Part 2) : 1986

Now, place the clamping device of the impact testing equipment with the securely clamped test piece under the vertical plunger of the performance testing apparatus (see Fig. 7 and Fig. 8).

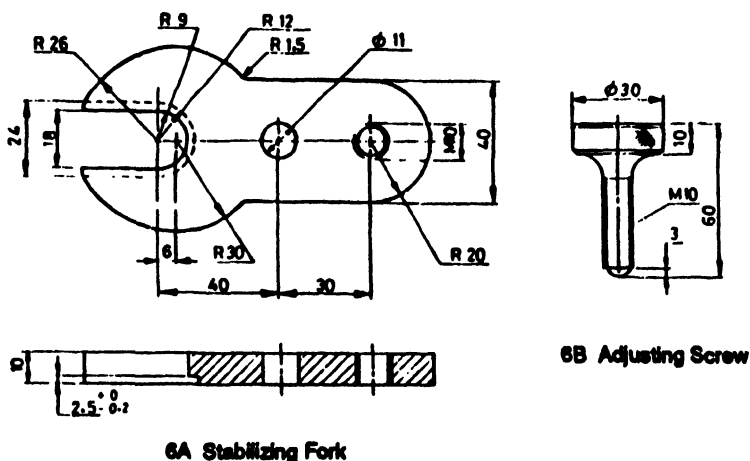
Position the vertical plunger about 1 mm inside the rear edge of the steel toe-cap and under the striking bar so that the capsule is behind the centre line of the bar. The bar shall test on the boot lengthwise roughly at right angles to the length of the test specimen.

B-3.2 Impact

Adjust the load to a height of 508 ± 5 mm above the top of the vertical plunger (see Fig. 8) and allow it to fall freely and strike the plunger. The impact should be of 14 kgf.m.

B-3.3 Measurement

Remove the capsule by unscrewing the adjusting screw (see Fig. 6B) and the clamping screw and measure the length from the top of the duralumin plunger to the base of the capsule by means of a slide caliper fitted with a vernier, capable of measuring the value to the nearest 0.1 mm. This value is the clearance inside the boot/shoe at the moment of maximum depression.'



All dimensions in millimetres.

FIG. 6 ATTACHMENT FOR FIXING THE CAPSULE

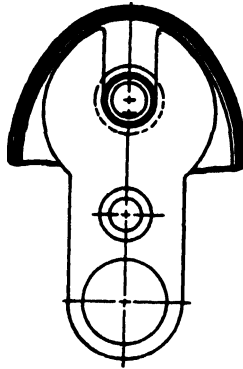


FIG. 7 PLACEMENT OF THE SAMPLE FOR DETERMINATION OF IMPACT VALUE

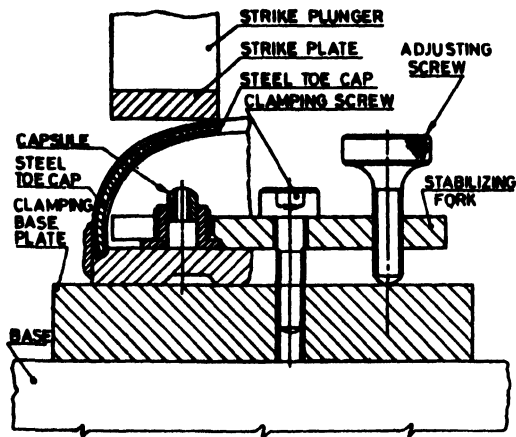


FIG. 8 POSITIONING AND CLAMPLING OF THE FOREPORT
OF THE SAFETY FOOTWEAR

(CHD 19)

AMENDMENT NO. 1 FEBRUARY 1988

TO

**IS : 1989(Part 2)-1986 SPECIFICATION FOR LEATHER
SAFETY BOOTS AND SHOES
PART 2 FOR HEAVY METAL INDUSTRIES**

(Fourth Revision)

(Page 9, clause 8.7, line 1) - Substitute
'10 mm' for '7.5 mm'.

(Page 9, clause 8.9.1, line 2) - Substitute
'35' for '34'.

(Page 17, clause 14.7, line 1) - Substitute
'10 mm' for '7.5 mm'.

(Page 18, clause 14.9.1, line 2) - Substitute
'35' for '34'.

(CDC 40)

Indian Standard

SPECIFICATION FOR LEATHER SAFETY BOOTS AND SHOES

PART 2 FOR HEAVY METAL INDUSTRIES

(Fourth Revision)

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Indian Standard
SPECIFICATION FOR
LEATHER SAFETY BOOTS AND SHOES
PART 2 FOR HEAVY METAL INDUSTRIES
(*Fourth Revision*)

0. FOREWORD

0.1 This Indian Standard (Fourth Revision) was adopted by the Indian Standards Institution on 7 January 1986, after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard was originally published in 1962 and subsequently revised in 1967. It was again revised in 1973 superseding IS : 3737-1966*. This standard was further revised in 1978 in two parts, namely, Part 1 dealing with leather safety boots and shoes for miners and Part 2 dealing with leather safety boots and shoes for heavy metal industries. Both the parts of the standard have again been revised. In this revision (Part 2) the vital characteristics and critical essential requirements of the safety boots and shoes, connected accessories, grinderies, etc, have been covered as obligatory requirements and other details of the materials, construction, manufacturing practice with their various requirements either have been deleted or made recommendatory as these were observed too restrictive for manufacturers.

0.3 Considering the nature of work in steel plants, the Committee decided to publish another standard, namely, IS : 10348-1982† so that industry get wider choice to suit their requirements.

0.4 The purchasers and distributors shall ensure that IS : 6519-1971‡ is adhered to by the wearers of the safety boots and shoes.

0.5 As per existing practice in the concerned industry, these safety foot-wears are made on lasts conforming to IS : 5520-1969§ popularly known in trade as Model No. 10883 and 9150 in sizes 5 to 11 (Paris points 38 to 45), fitted with protective steel toe caps.

*Specification for leather safety boots for workers in heavy metal industries.

†Specification for safety footwears for steel plants.

‡Code of practice for selection, care and repair of safety footwear.

§Specification for wooden lasts for heavy-duty boots.

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0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part 2) prescribes the requirements and methods of sampling and test for leather safety boots and shoes for workers engaged in heavy metal industries.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2050-1967† shall apply.

3. REQUIREMENTS

3.1 The leather safety boots and shoes for workers engaged in heavy metal industries shall comply with the requirements for design, materials, manufacture, finish and performance as given in Sections 1 and 2 respectively.

3.2 Fittings — The purchaser shall specify the fittings of these boots and shoes while placing order.

4. MARKING

4.1 Each boot and shoe shall be marked with the following particulars:

- a) The name of the manufacturer or its recognized trade-mark, if any, on the insole and on the full sock;
- b) The size and fitting number on the outer sole and on the waist of the full sock;
- c) Batch/Code No. on the insole;
- d) The year of manufacture on the insole and on the full sock; and
- e) Any statutory markings on the full sock.

*Rules for rounding off numerical values (revised).

†Glossary of footwear terms.

4.1.1 The boots and shoes may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. PACKING

5.1 The material shall be packed as agreed to between the purchaser and the manufacturer.

6. SAMPLING

6.1 The method of drawing representative samples of the material and the criteria for conformity shall be as prescribed in IS : 2051-1976*.

SECTION 1 SAFETY BOOTS

7. DESIGN

7.1 The boots shall be ankle high of derby pattern with 6 eyelets (see Fig. 1 and 2) with full vamp and shall be made on lasts conforming to IS : 5520-1969† corresponding to last model No. 10883 or 9180. The toe shall be reinforced with steel toe cap and tongue shall be padded. The vamp shall be fully lined.

8. MATERIALS

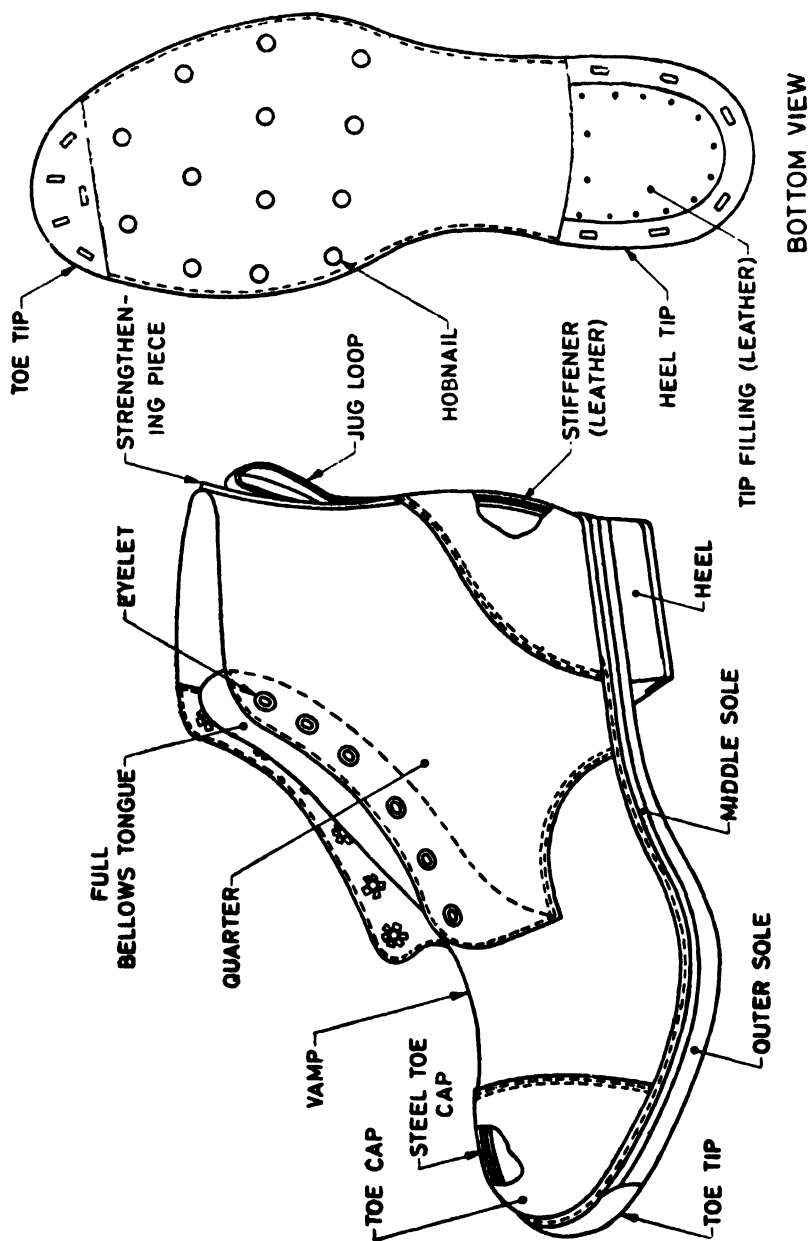
8.1 Upper Leather — Printed grain leather of any colour conforming to the following requirements of IS : 578-1985‡ shall be used:

- Tensile strength,
- Colour fastness test to dry rubbing,
- Solvent extractable substances, and
- Chromium (as Cr_2O_3) content.

*Method for sampling of leather footwear (*first revision*).

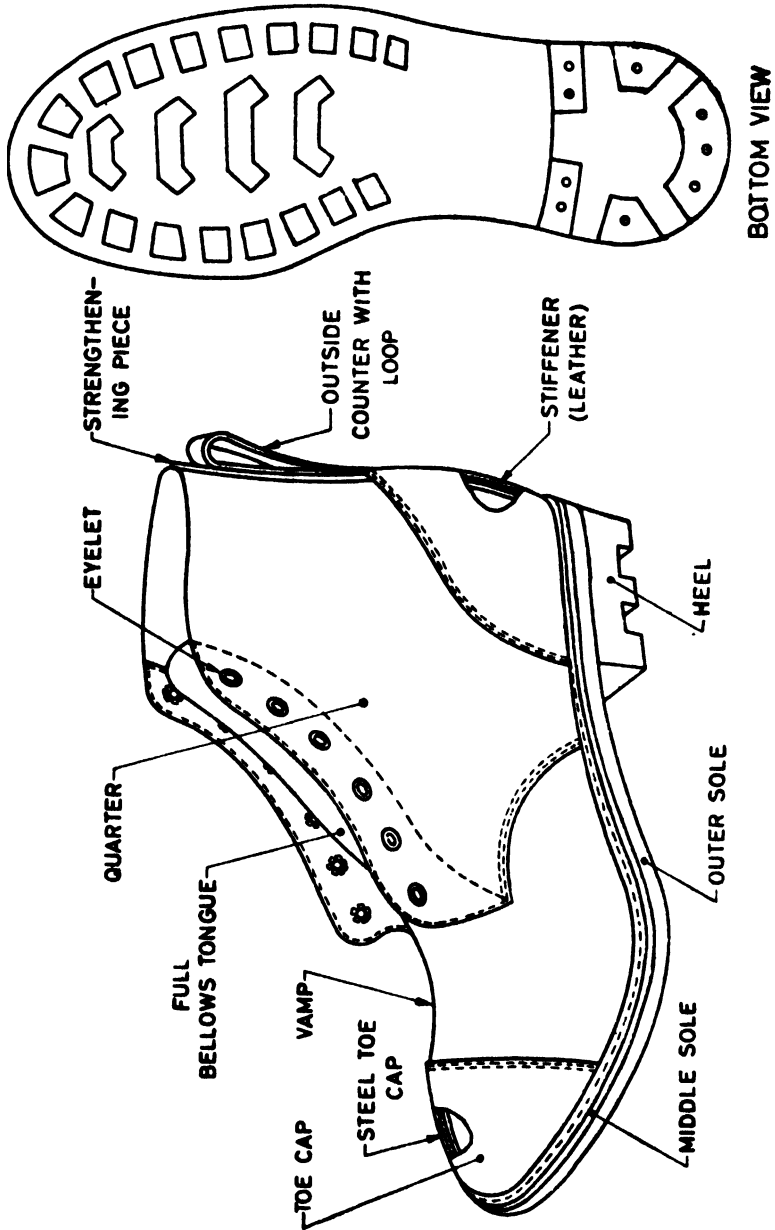
†Specification for wooden lasts for heavy-duty boots.

‡Specification for full chrome upper leather (*third revision*).



NOTE — This illustration is diagrammatic only and is not intended to illustrate the details of design.

FIG. 1 LEATHER SAFETY BOOTS WITH LEATHER SOLE FOR HEAVY METAL INDUSTRIES



NOTE — This illustration is diagrammatic only and is not intended to illustrate the details of design.

FIG. 2 LEATHER SAFETY BOOTS WITH RUBBER SOLE AND HEEL FOR HEAVY METAL INDUSTRIES

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8.2 Lining Leather — Vegetable tanned or combination tanned leather conforming to the following requirements of IS : 3840-1979* shall be used:

- a) Tensile strength,
- b) Stitch tear strength,
- c) Colour fastness test for finished leather to dry rubbing (applicable in case of combination tanned leather),
- d) Solvent extractable substances,
- e) Chromium (as Cr_2O_3) content (applicable in case of combination tanned leather), and
- f) Hide substance.

8.2.1 Coloured pigment or processed natural finished chrome splits may also be used as agreed to between the manufacturer and the purchaser.

8.3 Bottom Material — Either vegetable tanned sole leather or moulded solid rubber soles and heels shall be used.

- i) The sole leather shall conform the following requirements of IS : 579 (Part 1)-1973†:

- a) Water absorption,
- b) Resistance to cracking,
- c) Total ash, and
- d) Degree of tannage.

- ii) The moulded solid rubber sole and heels shall conform to Type 1 of IS : 5676-1970‡.

8.3.1 In case water resistant sole leather is required by the purchaser, such treated sole leather shall conform the following requirements of IS : 579 (Part 2)-1973§:

- a) Water absorption,
- b) Resistance to cracking,
- c) Total ash, and
- d) Hide substance.

*Specification for lining leather (*first revision*).

†Specification for sole leather: Part 1 Vegetable tanned sole leather (*second revision*).

‡Specification for moulded solid rubber soles and heels.

§Specification for sole leather: Part 2 Water resistant vegetable tanned sole leather (*second revision*).

8.4 Steel Toe Cap — Conforming to Type 1 of IS : 5852-1977* shall be used.

8.5 Tape — Cotton *NEWAR* (see IS : 1895-1982†) of 19 ± 1 mm, width herring bone weave shall be used.

8.6 Bottom Filling — A layer of fire proof cloth of thickness 2 mm *Min* shall be used.

8.7 Eyelet — Aluminium or brass coated steel eyelets of size 7.5 mm (collar dia) (see IS : 5041-1978‡) shall be used.

8.8 Toe Compound — Gum, glue or latex based adhesive compound shall be used.

8.9 Threads

8.9.1 For Upper Closing — Cotton thread, matching the colour of the upper leather and conforming to Variety No. 34 of IS : 1720-1978§ shall be used.

8.9.2 For Sole Stitching — Depending upon whether stitching is done by hand or by machine, the types of thread given below shall be used:

<i>Method of Stitching</i>	<i>Material</i>	<i>Construction</i>	<i>Minimum Breaking Strength in kg on 50 cm Length with Rate of Actuated Grips being 30 cm/min</i>
Stitching by machine:			
a) Shuttle and welt	Linen	8	23
b) Top	Linen	10	30
Stitching by hand	Linen	8	23

NOTE — Silk or synthetic thread of suitable quality may also be used if agreed to between the purchaser and the manufacturer.

8.10 Rivets — Spear-pointed, brass rivets of 14 ± 1 mm, and 16 ± 1 mm length, shall be used.

NOTE 1 — For extra reinforcement of toe portion, headless nails/blue cut tacks of length 14 ± 1 mm may be used, if agreed to between the purchaser and the manufacturer.

NOTE 2 — Grinders mentioned in **8.9** and **8.10** should be tested prior to manufacturer and not in finished footwear.

*Specification for protective steel toe caps for footwear (*first revision*).

†Specification for cotton *NEWAR* (*second revision*).

‡Specification for footwear and stationery eyelets (*first revision*).

§Specification for cotton sewing threads (*second revision*).

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8.11 Screw Wire — Brass screw wire (see IS : 8606-1977*) shall be used.

8.12 Heel Pin — Heel pins 29 ± 1 mm long shall be used for leather sole and heel pin 25 ± 1 mm long shall be used for rubber heel.

8.13 Shank — Rustproof steel, ribbed, 1.0 to 1.5 mm thick and not less than 12 mm in width shall be used (see IS : 10945-1984†).

8.14 Laces — Leather or fabric lace 85 ± 5 cm in length with a minimum breaking load of 20 kg when tested between 18 cm grips, the rate of traverse of power actuated grip being 30 cm/min. The lace shall be of thickness and width so as to easily pass through the eyelets. Cotton lace, if coloured black, shall be free from sulphur dyes (see Appendix A).

8.15 Tongue Lining — Woollen/flannel cloth, raised, minimum mass 200 g/m^2 shall be used.

8.16 Adhesive — Rubber based adhesive shall be used (see IS : 4663-1968‡).

8.17 Strengthening Piece — Leather, circular in shape, and 38 ± 2 mm in diameter shall be used.

8.18 Leather Components — Each leather component of boot shall comply with the thickness requirements prescribed in Table 1.

9. MANUFACTURE

9.1 Various components of the boots shall be cut to the thickness, shape and design as required (see Fig. 1 and 2, and Table 1). The upper components, specially the vamps and tongues, shall be skived.

9.2 The upper shall be closed on lock stitch machines. The quarter sides, toe cap and tongue shall be stitched with threads (see 8.9.1), the number of stitches being 20 to 25 per dm. At least two rows of stitching about 3 cm apart shall be done at the toe cap and counter and two rows about 6 mm apart or three rows about 3 mm apart at the sides.

9.3 The back seam shall be reinforced by stitching a tape (see 8.5) over the seams.

9.4 The counter shall be turned over to within 15 mm at the top of the leg so as to form a jug loop as shown in Fig. 1 and 2. The joint of the quarters shall be reinforced by stitching a wide strip of leather at the back. A strengthening leather piece (see 8.17) shall be pasted and stitched at the centre of the inside quarter.

*Specification for brass screw wire for footwear.

†Specification for shanks for footwear.

‡Specification for permanent rubber based adhesives for footwear industry.

TABLE 1 THICKNESS REQUIREMENTS FOR COMPONENTS*(Clauses 8.18, 9.1 and 14.17)*

SL No.	COMPONENT	MATERIAL AND RECOMMENDED LOCATIONS	THICKNESS <i>Min</i>
(1)	(2)	(3)	(4)
			mm
i)	Vamp	Butt portion of upper leather	1.5
ii)	Quarter:	Remaining best portion of upper leather	
	a) Unlined		1.5
	b) Lined		1.3
iii)	Toe cap, outside counter with jug loop and strengthening piece	Remaining best portion of upper leather	1.2
iv)	Loose/half tongue	Remaining best portion of upper leather	0.8
v)	Full sock	Chrome lining leather/splits	0.8
vi)	Vamp and quarter lining	Lining leather	0.8
vii)	Insole	Stuck and rolled shoulders of sole leather	3.2
viii)	Through middle sole:	Stuck and rolled shoulders of sole leather	
	a) For boots with leather sole		3.7
	b) For boots and shoes with rubber sole		2.1
	c) For shoes with leather sole		2.6
ix)	Outer sole	Butt portion of sole leather	4.2
x)	Lifts and split lifts	Compressed bellies or shoulders of sole leather	2.6
xi)	Stiffeners	Compressed bellies or shoulders of sole leather	2.1
xii)	Top piece	Butt portion of sole leather	3.5

NOTE — The thickness (not at skived portion) except full sock shall be checked before fabrication of boots and shoes.

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9.5 Eyelets shall be fitted at equal spacing in each of the face and clenched without distortion.

9.6 The full vamp shall be lined with leather and the tongue with raised woollen flannel cloth. The tongue shall be full bellows. A layer of raised woollen flannel cloth shall be stitched to the flesh side of the tongue to act as cushioned padding.

9.7 The stiffener shall be reinforced with cement toe compound. Steel toe cap shall be placed in between the toe cap and full vamp to the exact shape and contour of the last.

9.8 In the case of leather soled footwear the heel shall consist of whole lifts, two-piece lifts or one split lift and a top piece.

9.9 The boots shall be well lasted. The lasting edge of the stiffeners shall come under the grip of the lasting tacks and a clear lasting allowance of about 13 mm shall be provided all round.

9.10 The steel shank shall be fitted to the waist of the insole. The fire proof cloth (see **8.6**) shall be placed in between middle and insole and the middle sole shall be riveted with rivets of 14 and 16 mm lengths as indicated in **8.10**. Rivets of 16 mm length shall be used at the toe and the seat and rivets of 14 mm length at the remaining portion using 10 to 14 rivets/dm.

9.11 The leather sole shall be securely stitched aloft in an open channel with the middle sole by the lock stitch method using threads as indicated in **8.9.2**. The number of stitches shall be 16 to 20 per decimetre. The outer sole shall be pieced under the heel provided the joint shall be not less than 25 mm behind the breast of heel. The pieced sole shall be of the same quality and thickness as the sole. The outer sole shall be screwed by machine all round 25 mm apart maximum with brass screw wire. All screws shall penetrate through the outer sole, middle sole, upper and the insole without protruding. The heels shall be attached by 12 to 14 (see **8.12**) heel pins from inside.

9.12 In case of boots with rubber sole, the inside surface of the sole shall be suitably roughened and coated flesh with a thin layer of adhesive which shall also be applied on the outer flesh surface of the leather middle sole. The rubber sole shall be stitched with middle sole by the lock stitch method using threads. The number of stitches shall be 12 to 15 per dm. For reinforcement, 9 heel pins of 25 mm length shall be used from inside through the holes provided for the purpose (both by hand or machine method). A leather welt or split lift may be placed below heel.

10. FINISH

10.1 The sole and heel edges shall be neatly trimmed, scoured and finished to match the colour of the boot. The edge setting shall be uniformly done by using matching colour heel ball. The sole and heel edges of the rubber sole boots shall be secured and finished smooth. Each pair of boots shall be provided with a pair of full socks and lace (see **8.14**).

10.2 Boots with leather sole may be fitted with hobnails and rust proof toe tips and heel tips using toe tip and heel tip nails (see IS : 8060-1976*) flush with the tip fillings, if agreed to between the purchaser and the manufacturer.

10.3 The upper shall be finished bright by polishing. The boots shall be free from injurious folds and wrinkles in the upper, trapped air, blisters, embedded foreign matter and extensive surface markings. No metallic grinders shall protrude and cause discomfort to the wearers. The finish shall be in accordance with sound manufacturing practice.

10.4 The height of the leg when measured from inside shall be 150 ± 3 mm (both odds of a pair shall be equal in height) for size 8 and shall increase or decrease by 3 mm from size to size. The height of the heel when measured at the back portion in line with jug loop shall be 30 ± 2 mm for all sizes. The heel shall be in proper alignment with the tread of sole.

11. MASS

11.1 Boots with Leather Sole and Heel — The mass of boots with hobnails, toe tips and heel tips shall not exceed 1 750 g per pair of size 8. The mass of boots without hobnails, toe tips and heel tips shall not exceed 1 650 g per pair of size 8. The mass of boots with heel tip and toe tip without hobnails shall not exceed 1 700 g per pair for size 8. The mass shall increase or decrease by 75 g per pair for bigger or smaller sizes respectively.

11.2 Boots with Rubber Sole and Heel — The mass of boots shall not exceed 1 750 g per pair of size 8. The mass shall increase or decrease by 75 g per pair for bigger or smaller sizes respectively.

12. PERFORMANCE TEST

12.1 The safety boots when subjected to the impact test prescribed in Appendix B shall withstand a blow of 14 kgf.m. The test is intended to ensure that the toe portion of the boot is strong enough to withstand the

*Specification for heel tip and toe tip with nails.

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specified impact without any injury to wearer's toes. Further, the clearance inside the boot at the moment of maximum depression when subjected to impact test shall be:

- a) 15.0 mm or more in case of leather sole with hobnails, and
- b) 13.5 mm or more in case of leather sole without hobnails or rubber sole.

SECTION 2 SAFETY SHOES

13. DESIGN

13.1 The shoes shall be of derby design, with 4 eyelets or less as specified by the purchaser (see Fig. 3 and 4) and shall be made on lasts conforming to IS : 5520-1969* corresponds to last Model No. 10883 or 9150. The toe shall be reinforced with steel toe cap and the tongue shall be padded. The shoe shall be lined with leather throughout. The leather sole and heel may be fitted with toe tips heel tips and further reinforced with rust proof hobnails if required by the purchaser.

14. MATERIALS

14.1 Upper Leather — Printed grain leather of any colour conforming to the following requirements of IS : 578-1985† shall be used:

- a) Tensile strength,
- b) Colour fastness test to dry rubbing,
- c) Solvent extractable substances, and
- d) Chromium (as Cr_2O_3) content.

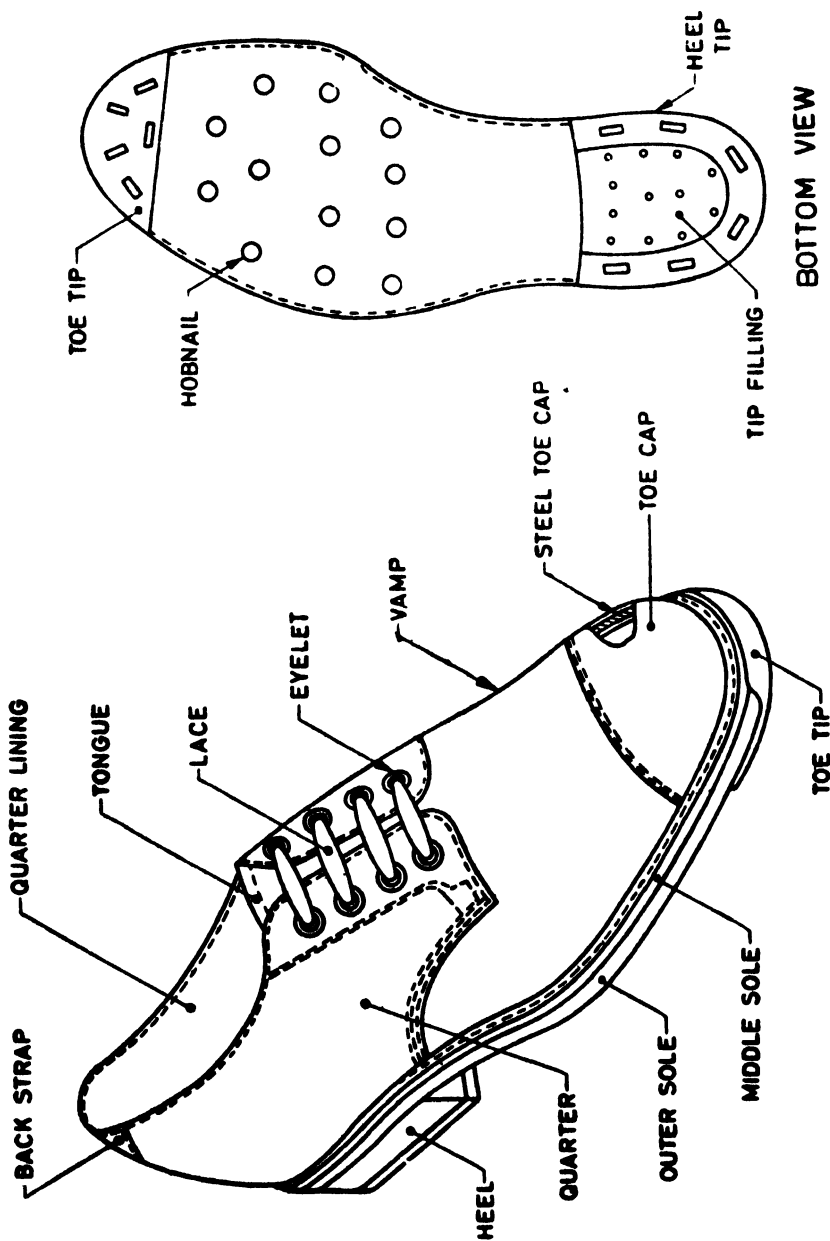
14.2 Lining Leather — Vegetable tanned or combination tanned leather conforming to the following requirements of IS : 3840-1979‡ shall be used:

- a) Tensile strength,
- b) Stitch tear strength,
- c) Colour fastness test for finished leather to dry rubbing (applicable in case of combination tanned leather),
- d) Solvent extractable substances,
- e) Chromium (as Cr_2O_3) content (applicable in case of combination tanned leather), and
- f) Hide substance.

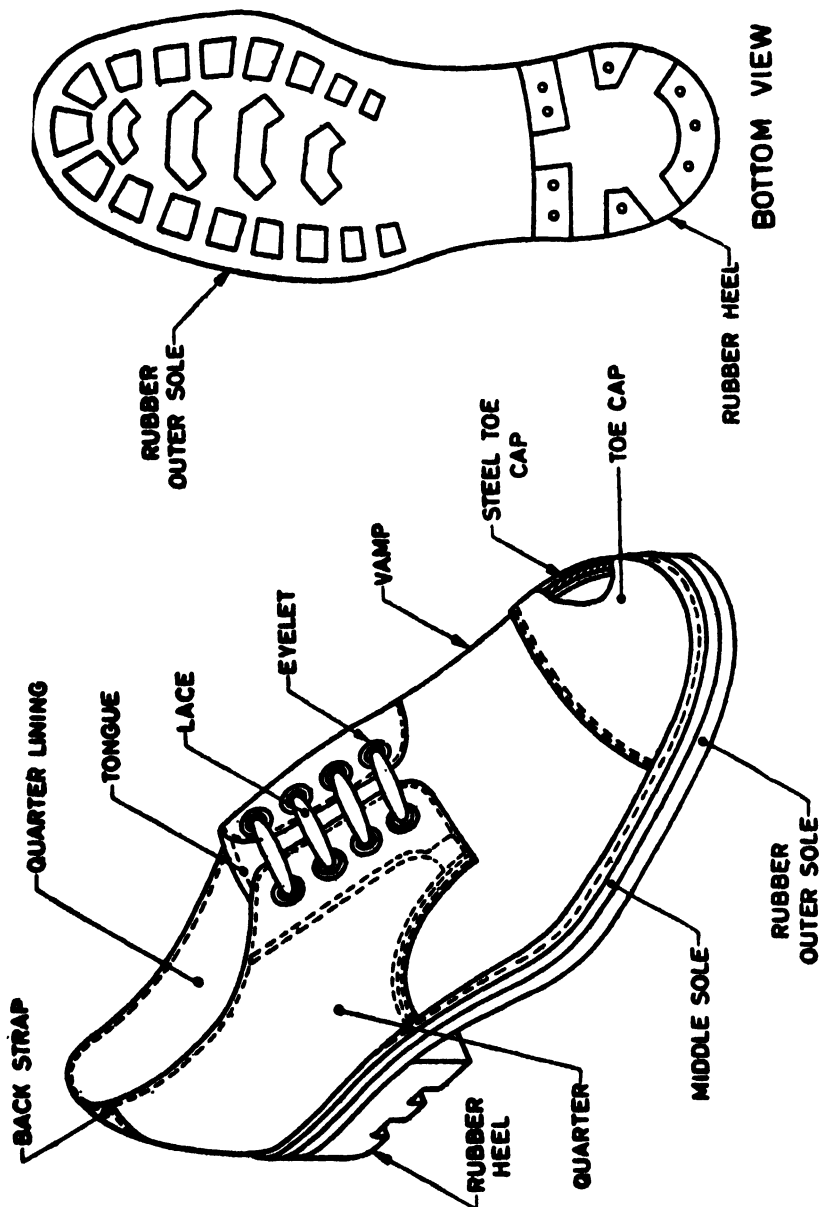
*Specification for wooden lasts for heavy duty boots.

†Specification for full chrome upper leather (*third revision*).

‡Specification for lining leather (*first revision*).



NOTE — This illustration is diagrammatic only and not intended to illustrate the details of design.
FIG. 3 LEATHER SAFETY SHOES WITH LEATHER SOLE FOR HEAVY METAL INDUSTRIES



NOTE — This illustration is diagrammatic only and is not intended to illustrate the details of design.

FIG. 4 LEATHER SAFETY SHOES WITH RUBBER SOLE AND HEEL FOR HEAVY METAL INDUSTRIES

14.2.1 Coloured pigment or processed natural finished chrome splits may also be used as agreed to between the manufacturers and purchasers.

14.3 Bottom Material — Either vegetable tanned sole leather or moulded soled rubber soles and heels shall be used.

- i) The sole leather shall conform to the following requirements of IS : 579 (Part 1)-1973*:
 - a) Water absorption,
 - b) Resistance to cracking,
 - c) Total ash, and
 - d) Degree of tannage.
- ii) The moulded solid rubber soles and heels shall conform to Type 1 of IS : 5676-1970†.

14.3.1 In case water resistant sole leather is required by the purchaser, such treated leather shall conform the following requirements of IS : 579 (Part 2)-1973‡:

- a) Water absorption,
- b) Resistance to cracking,
- c) Total ash, and
- d) Hide substance.

14.4 Steel Toe Cap — Conforming Type 1 of IS : 5852-1977§ shall be used.

14.5 Tape — Cotton *NEWAR* (see IS : 1895-1982||) of 19 ± 1 mm width herring bone weave shall be used.

14.6 Bottom Filling — A layer of fire proof cloth of thickness 2 mm minimum shall be used from heel to toe covering the middle sole.

14.7 Eyelet — Aluminium or brass coated steel eyelets of size 7.5 mm (collar dia) (see IS : 5041-1978¶) shall be used.

14.8 Toe Compound — Gum, glue or latex based adhesive compound shall be used.

*Specification for sole leather: Part 1 Vegetable tanned sole leather (*second revision*).

†Specification for moulded solid rubber soles and heels.

‡Specification for sole leather: Part 2 Water-resistant vegetable tanned sole leather (*second revision*).

§Specification for protective steel toe caps for footwear (*first revision*).

||Specification for cotton *NEWAR* (*second revision*).

¶Specification for footwear and stationery eyelets (*first revision*).

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14.9 Threads

14.9.1 For Upper Closing — Cotton thread, matching the colour of the upper leather and conforming to the Variety No, 34 and 30 of IS : 1720-1978* shall be used.

14.9.2 For Sole Stitching — Depending upon whether stitching is done by hand or by machine, the types of threads given below shall be used:

<i>Method of Stitching</i>	<i>Material</i>	<i>Construction</i>	<i>Minimum Breaking Strength in kg on 50 cm Length with Rate of Actuated Grips being 30 cm min</i>
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Stitching by machine:

a) Shuttle and welt	Linen	8	23
b) Top	Linen	10	30
Stitching by hand	Linen	8	23

NOTE — Silk or synthetic thread of suitable quality may also be used if agreed to between the purchaser and the manufacturer.

14.10 Rivets — Spear-pointed, brass rivets of 14 ± 1 mm, and 16 ± 1 mm length, shall be used.

NOTE — For extra reinforcement of toe portion, headless nails/blue cut tacks of length 14 ± 1 mm may be used, if agreed to between the purchaser and the manufacturer.

14.11 Screw Wire — Brass screw wire (see IS : 8606-1977†) shall be used.

14.12 Heel Pin — Heel pins 29 ± 1 mm long shall be used for leather sole and heel pin 25 ± 1 mm long shall be used for rubber heel.

14.13 Shank — Rustproof steel, ribbed 1.0 to 1.5 mm thick and not less than 12 mm in width shall be used (see IS : 10945-1984‡).

14.14 Laces — Cotton laces shall conform to the length and breaking load of Variety No. L/60/36 of IS : 4778-1968§ of any colour. If the laces are coloured black, it shall be free from sulphur dyes (see Appendix A).

*Specification for cotton sewing threads (*second revision*).

†Specification for brass screw wire for footwear.

‡Specification for shanks for footwear.

§Specification for cotton laces for footwear (*first revision*).

14.15 Tongue Lining — Woollen/flannel cloth, raised, minimum mass 200 g/m² shall be used.

14.16 Adhesive — Rubber based adhesive (*see* IS : 4663-1968*) shall be used.

14.17 Leather Components — Each leather component shall comply with the thickness requirements prescribed in Table 1.

15. MANUFACTURE

15.1 The various components of the shoe shall be cut to the thickness, shape and design as required (*see* Fig. 3 and 4, and Table 1). The upper components specially the vamp and tongue shall be skived.

15.2 The upper shall be closed on lock stitch machines. The quarter sides, toe cap and tongue shall be stitched with thread of Variety No. 34 and the rest with Variety No. 30 (*see* **14.9.1**). The number of stitches shall be 25 to 30 per dm. At least two rows of stitching about 3 mm apart shall be done at the toe cap and counter and two rows about 6 mm apart or three rows about 3 mm apart at the sides.

15.3 The joint of the quarter shall be reinforced by stitching a wide strip of leather at the back.

15.4 Eyelets shall be fitted at equal spacings and clenched without distortion.

15.5 The full vamp and quarter shall be lined with leather and tongue with raised woollen/flannel cloth. The tongue shall be loose or half bellows. A layer of raised woollen/flannel cloth shall be stitched to the flesh side of the tongue to act as cushioned padding.

15.6 The stiffener shall be reinforced with toe compound. Steel toe cap shall be placed in between the toe cap and full vamp to the exact shape and contour of the last.

15.7 In the case of leather soled footwear the heel shall consist of whole lifts, two-piece lifts or one split lift and a top piece.

15.8 The shoes shall be well lasted. The lasting edges of the stiffeners shall come under the grip of the lasting tacks and a clear lasting allowance of about 13 mm shall be provided all round.

15.9 The steel shank shall be fitted to the waist of the insole. The fire proof cloth (*see* **14.6**) shall be placed in between middle and insole and the middle sole shall be riveted with rivets of 14 mm and 16 mm lengths as indicated in **14.10**. Rivets of 16 mm length shall be used at the toe and the seat and rivets of 14 mm length at the remaining portion using 10 to 14 rivets per dm.

*Specification for permanent rubber based adhesives for footwear industry.

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15.10 The leather sole shall be securely stitched aloft in an open channel with the middle sole by the lock stitch method using threads as indicated in **14.9.2**. The number of stitches shall be 16 to 20 per decimetre. The outer sole shall be pieced under the heel provided the joint shall be not less than 25 mm behind the breast of the heel. The pieced sole shall be of the same quality and thickness as the sole. The outer sole shall be screwed by machine all round 25 mm apart maximum with brass screw wire. All screws shall penetrate through the outer sole, middle sole, upper and the insole without protruding. The heels shall be attached by 12 to 14 heels pins (see **14.12**) from inside.

15.11 In case of shoes with rubber sole, the inside surface of the sole shall be suitably roughened and coated with a thin layer of adhesive which shall also be applied on the outer surface of the leather middle sole. The rubber sole shall be stitched with middle sole by the lock stitch method using threads indicated in **14.9.2**. The number of stitches shall be from 12 to 15 stitches per dm. For reinforcement, 9 heel pins of 25 mm length shall be used from inside through the holes provided for the purpose both by hand and machine method.

16. FINISH

16.1 The sole and heel edges shall be neatly trimmed, scoured and finished to match the colour of the shoe. The edge setting shall be uniformly done by using matching colour heel ball. The sole and heel edges of the rubber sole shoes shall be secured and finished smooth. Each pair of shoes shall be provided with a pair of full sock and laces (see **14.14**).

16.2 Shoes with leather sole may be fitted with hobnails and rustproof toe tips and heel tips using toe tip and heel tip nails (see IS : 8060-1976*) flush with the tip fillings, if agreed to between the purchaser and the manufacturer.

16.3 The upper shall be finished bright by polishing. The shoe shall be free from injurious folds and wrinkles in the upper, trapped air, blisters embedded foreign matter, excessive surface markings. The finish shall be in accordance with sound manufacturing practice.

16.4 The height of the heel when finished shall be 30 ± 2 mm for all sizes. The heel shall be in proper alignment with the tread of the sole.

17. MASS

17.1 Shoes with Leather Sole and Heel — The mass of shoes with hobnails, toe tips and heel tips shall not exceed 1 600 g per pair of size 8. The mass of shoes without hobnails, toe tips and heel tips shall not exceed

*Specification for heel-tip and toe-tip with nails for footwear.

1 500 g per pair of size 8. The mass of the shoes with heel tips and toe tips but without hobnails shall not exceed 1 550 g per pair of size 8. The mass shall increase or decrease by 50 g per pair for bigger or smaller sizes respectively.

17.2 Shoes with Rubber Sole and Heel — The mass of shoes shall not exceed 1 600 g per pair of size 8. The mass shall increase or decrease by 50 g per pair for bigger or smaller sizes respectively.

18. PERFORMANCE TEST

18.1 The safety shoes when subjected to the impact test prescribed in Appendix B shall withstand a blow of 14 kgf.m. The test is intended to ensure that the toe portion of the shoe is strong enough to withstand the specified impact without any injury to wearers toes. Further, the clearance inside the shoe at the moment of maximum depression when subjected to impact test shall be:

- a) 150 mm or more in case of leather sole with hobnails, and
- b) 135 mm or more in case of leather sole without hobnails or rubber sole.

A P P E N D I X A (*Clauses 8.14 and 14.14*)

METHOD FOR DETERMINATION OF SULPHUR DYES IN BLACK COLOURED LACES

A-1. PROCEDURE

A-1.1 Boil the laces in alkaline hydrosulphite solution for one minute. If the shade is reduced to pale brown or yellow colour and on oxidation restored to the original colour, sulphur dyes shall be suspected to be present.

A-1.2 For confirmation, boil the laces in acid stannous chloride solution in a test tube covered with a piece of filter paper moistened with lead acetate. A blackish/brown stain with metallic lustre confirms the presence of sulphur dyes.

APPENDIX B

(*Clauses 12.1 and 18.1*)

DETERMINATION OF IMPACT VALUE

B-0. GENERAL

B-0.1 An impact test for determining the performance of toes of protective boots/shoes reinforced with steel toe cap to withstand a blow of 14 kgf.m is described here.

B-1. REQUIREMENTS

B-1.1 Test Specimen — The boot or shoe shall be tested only after minimum of 24 hours from its manufacture.

B-1.2 The test shall be made on the toe of finished boot/shoe sampled from each size of a lot.

B-2. TEST MACHINE

B-2.1 The test machine shall be such that a 27.0 ± 0.2 kg mass can be allowed to fall freely on vertical guides from various predetermined heights to strike a cylindrical mild steel plunger, 28 mm in diameter and 14.5 mm long. The plunger shall be freely supported in a vertical guide, and shall have attached to its lower end a horizontal mild steel bar 115 mm long, 38 mm wide and 100 mm thick. The bar shall be such that it can rest on the toe of the boot/shoe in a position specified in **B-4.1**. The upper end of the plunger shall have a mild steel plate 63 mm wide screwed to it which can be replaced if worn out. The above dimensions shall have a tolerance of ± 1 mm.

B-2.1.1 The base of the machine shall be solidly constructed of hard wood 5 mm thick. To this shall be bolted a metal block 50 mm thick to support the steel plate on which the boot/shoe rests (see **B-4.2**).

B-3. MEASUREMENT OF IMPACT VALUE

B-3.1 Point of Measurement of Clearance Inside the Boot or Shoe — The position or point of measurement of clearance inside the boot/shoe shall be found by using a size 8 last of the same shape as that on which the boot/shoe to be tested was made (see Fig. 5) The toe point is found by placing the last on a flat surface so that its inside surface and toe touches two vertical places at right angles to each other. *M* is the point of contact of the toe with one of these planes. A line *MX* is drawn from toe to heel (the heel point can be located by eye with sufficient accuracy) and 28 mm is marked off down this line from the toe to give point *A*. A line perpendicular to *XY* is drawn through *A* cutting the outside edge of the last at *P* and the inside edge at *Q*.

NOTE — For a new last shape, the procedure given in **B-3.1** may be modified suitably by the testing laboratory if in their opinion the position obtained for measuring clearance is not a reasonable one.

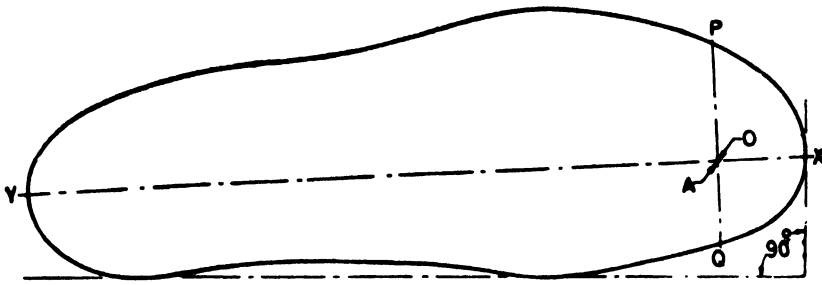


FIG. 5 POSITION FOR MEASUREMENT OF CLEARANCE INSIDE THE BOOT OR SHOE

B-3.1.1 The boot/shoe to be tested shall be drilled through the sole in such a manner that with the last in it, the drill comes through the insole at the point O on the last, and is approximately perpendicular to the surface of the last at the point. A suitable jig can be devised for this purpose.

B-3.2 Method of Measurement of Clearance at the Moment of Maximum Depression — A device capable of measuring the clearance at moment of maximum depression, between the insole and the upper shall be fixed to the insole by means of a screw passing through the hole drilled in the position defined in **B-3.1.1**. A suitable measuring device is shown in Fig. 6.

B-4. PROCEDURE

B-4.1 Clamping of Boot or Shoe — The boot/shoe, with the measuring device inserted, shall be tightly clamped so that it cannot move longitudinally or laterally, with its toe part on the flat horizontal steel plate. The angle of the boot/shoe shall be such that the forward 65 mm of the sole is judged by the operator to be on the average horizontal, and the boot/shoe shall be supported in this position by a wedge under the heel, the wedge being such that it supports only the heel and no part of the sole.

B-4.2 Position of Boot or Shoe — The boot or the shoe clamped as specified in **B-4.1** shall be positioned under the striking bar so that the measuring capsule is 10 mm behind the central line of the bar. The bar shall rest on the boot or the shoe with its longest direction roughly at right angles to the length of the boot or shoe.

B-4.3 Adjust the mass to a height of 508 ± 5 mm above the top of the vertical plunger as specified in **B-2.1** and allow it to fall freely. This gives the mass an impact of 14 kgf.m as required in **12.1** and **18.1**. Measure the clearance inside the boot or the shoe at the moment of maximum depression in mm and report the value.

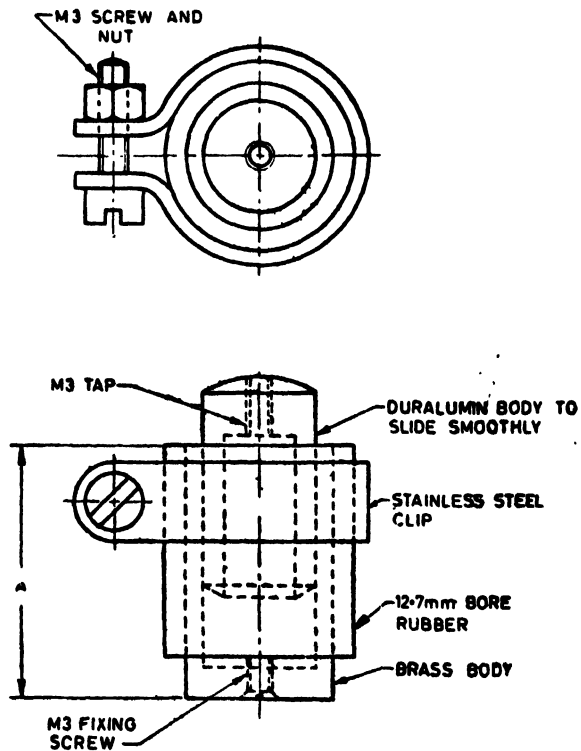


FIG. 5 SAFETY BOOT OR SHOE MEASURING CAPSULE

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(Continued from page 1)

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